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JPRS: 4577

28 April 1961

ELECTRIC POWER STATIONS IN THE  
CHINESE PEOPLE'S REPUBLIC\*

-USSR-

by S.K. Kamenskiy

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## FOREWORD

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JPRS: 4577

CSO: 1716-S

ELECTRIC POWER STATIONS IN THE  
CHINESE PEOPLE'S REPUBLIC\*

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Following is the translation of an article by  
S.K. Kamenskiy in Energokhozyaystvo za Rubezhom  
(Electrical Power Abroad), Moscow, January-  
February 1961, No 1, pages 36-39/.

The Shanghai Thermoelectric Station is located near the village of Wu-Hsiang, in suburban Shanghai, at a distance of about 20 kilometers from the central portions of the city, on the bank of the Hwang-Pu River. It is being constructed to operate at a high pressure of 100 atmospheres and at a temperature of 540° C. Turbo-generator No 1, having a power of 25 mwt (megawatts) went into operation on 5 November, 1959; the second such installation began to function toward the end of 1959.

Due to the extreme weakness of the soil in the area, the foundations of the main building were laid atop pile supports at the 3.0 marker level. The reinforced concrete piles of length 28-30 meters were sunk by the vibration method. The support frame is made of monolithic reinforced concrete, while the walls are of brick (see figure 1) (figures not reproduced here due to poor quality; see end of report for captions).

The engine room girders (24 meter aisle span) are of composite reinforced concrete; the roof covering is of reinforced concrete elements. Such sectional elements were widely used in other portions of the building as well (stairways, scaffolds, inter-story coverings, etc.).

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\*In addition to the sources listed at the end of the article, the author also made use of certain facts mentioned by Comrade Grishin (Orgenergostroy) in his report of 25 February, 1960, on the planning and construction of electric power stations in the Chinese People's Republic.

The column spacing of the 10 aisles of Station line I, including 25 mwt turbo-generators No 1 and 2 and 220 ton/hour boilers No 1 and 2 is equal to 6500 millimeters.

The work of designing this Station began in mid-1958, and was carried out by the Shanghai Power Production Planning Institute. The project plan in finished form was issued during the first quarter of 1959; actual working plans were developed simultaneously.

Preparatory work on the construction of the Station was initiated in January, 1959; the actual large-scale construction began in May, 1959, and was completed within the space of six months. Among the buildings constructed over this six month period are the following: the main reinforced concrete building with a height of up to 42 meters (according to the boiler room) with aisles, the 24 meter engine room, the 7.5 meter deaeration facility, the 28.5 meter boiler room, and an 8 meter bin; other construction work completed included the 80 meter reinforced concrete smoke-stack, the heat supply scaffold bridges of total length 280 meters, and the first portion of the 300 mwt riverbank pumping facility (constructed by the drop method).

The Peking Thermoelectric Station, designed to operate at high pressures, is being built in the eastern part of the city of Peking.

Two 25 mwt and one 50 mwt turbo-generators, all designed to operate at 100 atmospheres and 540° C, were put into operation in 1958-1959. The planning of the Station line I was carried out by Soviet organizations. The 100 mwt turbo-generator No 4 was put into operation in September, 1959. The latter facility was planned by the Peking Power Production Planning Institute.

The main building (figure 2) is constructed of monolithic reinforced concrete, the roof covering is of sectional elements, and the walls are brick. The aisles are the same as those of the Shanghai Thermoelectric Station, but the column spacing is 6000 millimeters. The work of planning this portion of the expanded facility began in the third quarter of 1958.

It is necessary to emphasize that the VK-100-6 turbo-generator put into operation in September, 1959, was the first 100 mwt facility installed in the Chinese People's Republic (figure 3). The lack of experience in the planning, construction, and assembly of stations with aggregates of this class constituted a considerable impediment to the work. The total construction cycle for this portion of the project, including the preparatory work and planning, took up about 12 months.

These two projects do not constitute exceptions. It took approximately the same amount of time to build the Harbin Thermoelectric Station, having a line I power of 50 mwt (final power 250 mwt), and equipped with 100 atmosphere, 230 ton per hour boilers built in the Chinese People's Republic with medium-speed rotors and 25 mwt turbines produced by the Harbin Factory.

The total increase of power production potential in the Chinese People's Republic in 1959 equalled 3.2 million kwt (kilowatts); thermoelectric stations accounted for 2.8 million kwt of this figure. The increase planned for 1960 is about 4.2 million kwt. Altogether, the Chinese People's Republic is presently building 184 major and medium electric power stations, whose total planned power potential exceeds 26 million kwt. A construction time of 15 to 18 months has presently been attained for major thermoelectric power stations; the analagous figure for hydroelectric stations is from 2 to 4 years.

Such exceptionally shortened construction times are attained due to the extensive utilization of sectional reinforced concrete as building elements, and in a number of cases as support structures. For example, the Thermoelectric Station of the Fushun Petroleum Refinery is constructed completely of sectional reinforced concrete elements.

Extensive use is made of standardized design layouts for the construction of small stations of up to 25 mwt. For large stations having aggregates of 25 mwt and over, the ordering of the basic equipment (boilers, turbo-generators, transformers) is carried out on the basis of a simplified building design which includes only the layout of the main facility, and specifications as to the power and number of aggregates, as well as the type of coal to be used. The actual construction designs are worked out at this stage along with the elaboration of the project plan and the orders for auxilliary equipment. The trend for "single-stage" planning permits a time saving of up to 6-8 months in the total construction cycle.

The construction and assembly areas are full of equipment concentrated there during the comparatively short period of the most intensive work. Materials and equipment to be installed are concentrated in the area in advance. There is good organization in the rendering of mutual assistance by individual stations and power production agencies, and in the mobilization of internal equipment resources (pumps, electrical motors, transformers, etc.).

According to the incomplete data of the Water and Power Production Ministry of the Chinese People's Republic, just during the months of August and September, 1959, the

power facilities construction organizations were by this method of "mutual support and assistance" able to reallocate throughout the entire country over 6000 tons of materials and over 2000 units of various pieces of equipment; this permitted the introduction of about 400 mwt of new power on or ahead of schedule.

Large numbers of construction and assembly workers are concentrated for short periods of time at the building sites. The construction of line I of the Shanghai Thermoelectric Station assumed large-scale proportions on 3 May, 1959, and was to a great extent completed by November. During this period, 2,500 construction workers and 1,500 assembly men were employed at the site. Of the latter group, 479 persons were transferred from the electrical power construction organizations of five neighboring provinces.

Temporary facilities are light and simple; in many cases, these are buildings with a bamboo carcass, panel-type walls and mud plasterwork. They are employed both as temporary industrial quarters and temporary living facilities. Such buildings are erected in 7-10 days; their price is 30-40 roubles per meter squared, or 50-60 roubles per meter squared for brick siding.

Favorable climatic conditions are a necessary prerequisite to this type of construction, and for this reason the concentration of labor forces and the more intense efforts put forth during the summer season simplify the solution to the problem of temporary living quarters. It is of interest to note that the total cost of part III of the general budgets in the Chinese People's Republic usually amounts to 2-3%.

Extensive use is made of progressive methods of work organization and the maximum expansion of the construction-assembly work front. Thus, for example, all construction work on the Shanghai Thermoelectric Station was completed according to the null cycle directly after the installation of the main building columns. This permitted the initiation of assembly work on the boilers about 1-1.5 months earlier, and hence the setting of an earlier date for the start of operations. The 80 meter high reinforced concrete smokestack was built in 21 days simultaneously with other objects of construction.

Extensive use was likewise made of the assembling of equipment into larger units in areas outside the installation zone. In connection with the insufficiency of areas available for assembly (length 120 meters instead of the necessary 180-240 meters), there were organized

auxilliary assembly areas where the components of the water economizer, the air heater, and other equipment were put together into larger blocks. The sizes of such blocks reached lengths of 25 meters and weights of 22-24 tons.

The parallel completion of construction and assembly work was also widely practised; this involved the development of special flow sheets, especially with reference to the main building in accordance with a definite stage-wise system.

#### Photograph Captions

- Figure I. The Shanghai Thermoelectric Station during the assembly process.
- Figure II. A general view of the 200 mwt Peking Thermoelectric Station No 1.
- Figure III. The first 100 mwt aggregate installed in the Chinese People's Republic at the Peking Thermoelectric Station.

#### References

1. Shui-li yu Tien-li (The Water Power Industry and Power Production), 1959, Nos 23 and 24.
2. The newspaper Jen-min Jih-pao, 4/10/IX, 21/X, 29/X, 14/XI, and 10/XII 1959.
3. The magazine Druzhba (Friendship), 1959, Nos 4 and 48.